

What is claimed is:

1. A method for deploying a vascular filter device during a procedure, comprising:
(a) positioning a vascular filter device in a vasculature of a patient distal of a
portion of a blood vessel to be accessed during a procedure, the filter device comprising;

5 (i) a guide member comprising a proximal end and a distal end;
(ii) means for filtering coupled to said distal end of said guide member;
(iii) means for deploying said means for filtering, said means for deploying
being coupled to said guide member; and

(iv) a restraining mechanism coupled to said guide member and said means
10 for filtering, said restraining mechanism being adapted to prevent said means for
filtering being deployed, said restraining mechanism comprising:

(1) a sleeve surrounding said distal end of said guide member, said
sleeve having a closed state and an open state; and

(2) a securing member coupled to said sleeve and retaining said
15 sleeve in a closed position; and

(b) removing said securing member to release said sleeve to allow said sleeve to
move to said open state where said means for filtering is deployed.

2. A method as recited in claim 1, wherein said means for filtering comprises a
20 filter.

3. A method as recited in claim 3, wherein said means for deploying comprises a plurality of struts coupled to said distal end of said guide member, at least one of said plurality of struts being biased to extend outwardly to deploy said filter.

5 4. A method as recited in claim 3, further comprising releasing said plurality of struts to said at least one of said plurality of said struts to extend outwardly to deploy said filter.

5. A method as recited in claim 1, further comprising positioning a capture
10 catheter on at least a portion of said guide member.

6. A restraining mechanism configured to prevent a plurality of struts of a filter device from extending outwardly prior to deploying a filter of the filter device, the restraining mechanism comprising:

15 (a) a sleeve adapted to be disposed substantially at a distal end of the filter device, said sleeve being adapted to apply a restraining force to the plurality of struts of the filter device to prevent the plurality of struts from extending outwardly; and

(b) at least one actuating member coupled to said sleeve, said at least one actuating member being adapted to release said restraining force of said sleeve and
20 enable the plurality of struts of the filter device to extend outwardly.

7. A restraining mechanism as recited in claim 6, wherein said at least one actuating member is adapted to cause said sleeve to move in a proximal direction upon moving said at least one actuating member in said proximal direction.

5 8. A restraining mechanism as recited in claim 6, wherein said sleeve is coupled to at least two of said plurality of struts.

9. A restraining mechanism as recited in claim 6, wherein said sleeve comprises at least one preferential separation region.

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10. A restraining mechanism as recited in claim 9, wherein said at least one actuating member cooperates with said at least one preferential separation region and is adapted to preferentially separate said sleeve at said at least one preferential separation region.

11. A restraining mechanism configured to prevent a plurality of struts of a filter device from extending outwardly prior to deploying a filter of the filter device, the restraining mechanism comprising:

(a) means for applying a restraining force to the plurality of struts of the filter device to prevent the plurality of struts from extending outwardly, said means for apply the restraining force being coupled to at least one of the plurality of struts; and

(b) at least one actuating member cooperating with said means for applying the restraining force, said at least one actuating member being adapted to release said restraining force of said means for applying said restraining force and enable the plurality of struts of the filter device to extend outwardly to deploy the filter.

12. A restraining mechanism as recited in claim 11, wherein said means for applying the restraining force comprises a sleeve attached to each of said plurality of struts, said sleeve comprising at least one preferential separation region.

13. A restraining mechanism as recited in claim 12, wherein said at least one actuating member cooperates with said at least one preferential separation region, said at least one actuating member being adapted to cause said means for applying the restraining force to preferentially separate at said at least one preferential separation region.

14. A restraining mechanism as recited in claim 11, wherein said means for applying the restraining force comprises a sleeve substantially surround the plurality of struts.

15. A restraining mechanism as recited in claim 14, wherein said sleeve is adapted to slide in a proximal direction upon moving said actuating member in the proximal direction.

5 16. A restraining mechanism as recited in claim 15, wherein said sleeve is a polymer sleeve.

17. A method for releasing a plurality of struts of a filter device during a procedure, comprising:

10 (a) positioning a filter device in a vasculature of a patient distal of a portion of a blood vessel to be accessed during a procedure, the filter device comprising:

(i) a guide member comprising a distal end;

(ii) a plurality of struts cooperating with said distal end of said guide member;

15 (iii) a filter coupled to said guide member; and

(iv) a restraining member cooperating with said plurality of struts to prevent said plurality of struts from extending outwardly; and

(b) actuating an actuating member cooperating with said restraining member, wherein actuating said actuating member releases said plurality of struts to deploy said filter.

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18. The method as recited in claim 17, wherein actuating said actuating member comprises moving said actuating member in a proximal direction.

19. The method as recited in claim 17, wherein actuating said actuating member further comprises moving said actuating member in a proximal direction to remove said actuating member from cooperating with said restraining member.

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20. A filter device comprising:

(a) a guide member comprising a distal end, a proximal end, and a lumen extending from the distal end to the proximal end,

(b) a plurality of struts coupled to said guide member, at least one of said plurality
10 of struts being biased to extend outwardly;

(c) a filter coupled to at least two of said plurality of struts, said filter being adapted to filter material from a blood stream; and

(d) means for preventing said plurality of struts extending outwardly until said filter is to be deployed into a blood vessel.

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21. A filter device as recited in claim 20, wherein each strut of said plurality of struts is adapted to extend outwardly away from a longitudinal axis of said lumen.

22. A filter device as recited in claim 20, wherein said means for filtering
20 comprises a filter, said filter comprising a plurality of pores.

23. A filter device as recited in claim 20, wherein at least one of said plurality of struts is biased toward a longitudinal axis of said lumen.

24. A filter device as recited in claim 20, further comprising at least one radiopaque
5 marker.

25. A filter device as recited in claim 20, wherein a portion of said guide member is made radiopaque.

10 26. A filter device comprising:

(a) a guide member comprising a distal end, a proximal end, and a lumen extending from the distal end to the proximal end;

(b) a strut assembly coupled to said distal end of said guide member, said strut assembly comprising a plurality of struts, at least one of said plurality of struts being biased to
15 extend outwardly away from a longitudinal axis of said lumen of said guide member;

(c) a filter coupled to at least one of said plurality of struts, said filter being adapted to filter material from fluid flowing in a fluid stream within which said filter is disposed; and

(d) a restraining member surrounding at least one of said plurality of struts and said distal end of said guide member, said restraining member being adapted to prevent said
20 plurality of struts extending outwardly and subsequently release said plurality of struts when said filter is to be deployed into the fluid stream.

27. A filter device as recited in claim 26, wherein said filter comprises a plurality of pores, at least two of said plurality of pores being differently configured one from another.

28. A filter device as recited in claim 26, wherein said filter comprises a plurality of
5 pores, wherein each of said plurality of pores is sized in the range from about 50 microns to about 300 microns.

29. A filter device as recited in claim 26, wherein said restraining member is adapted to be moved in a proximal direction to enable said plurality of struts to extend
10 outwardly.

30. A filter device as recited in claim 29, further comprising an actuating member coupled to said restraining member and extending substantially to said proximal end of said guide member, said actuating member being adapted to move in the proximal direction to
15 move said restraining member in the proximal direction.

31. A filter device for percutaneous insertion into a blood vessel during a procedure, the filter device comprising:

(a) a guide member comprising a distal end, a proximal end, and a lumen extending from said distal end to said proximal end, said guide member being configured to act as an exchange guidewire;

(b) a filter assembly coupled to said guide member, said filter assembly comprising a filter adapted to filter material from a blood stream and a plurality of struts; and

(c) means for preventing said plurality of struts from extending outwardly to allow said filter to deploy into the blood stream in the blood vessel.

32. A filter device as recited in claim 31, wherein each of said plurality of struts is biased to open said filter.

33. A filter device as recited in claim 31, wherein said filter comprises an open proximal end and a closed distal end, said proximal end being adapted to conform to an inner surface of the blood vessel.

34. A filter device as recited in claim 31, wherein said filter opens in response to a force applied by the blood flowing through the blood vessel.

35. A filter device as recited in claim 31, wherein said filter is fabricated from at least one of a woven mesh material, a braided material, or a film material.

36. A filter device as recited in claim 31, wherein said filter comprises a material comprising a plurality of pores.

5 37. A filter device as recited in claim 36, wherein each of said plurality of pores is sized in the range from about 50 microns to about 200 microns.

38. A filter device as recited in claim 36, wherein a major axis and a minor axis of each of said plurality of pores is sized in the range from about 50 microns to about 300
10 microns.

39. A filter device as recited in claim 36, wherein a major axis and a minor axis of each of said plurality of pores is sized in the range from about 50 microns to about 210
15 microns.

40. A filter device as recited in claim 31, further comprising means for radiopacity coupled to at least one of said guide member, said filtering, said plurality of struts, and said means for preventing.

20 41. A filter device as recited in claim 40, wherein said means for radiopacity comprises at least one of (i) a plurality of markers fabricated from a radiopaque material (ii) a

plurality of markers coated with a radiopaque material and (iii) a plurality of markers doped with a radiopaque material

42. A filter device as recited in claim 31, wherein said filter assembly is integral
5 with said guide member.

43. A filter device as recited in claim 31, wherein said filter assembly is a separate assembly coupled to said guide member.

44. A filter device comprising:

(a) a guide member comprising a distal end, a proximal end, and a lumen extending from the distal end to the proximal end;

(b) a filter assembly coupled to said guide member, said filter assembly

5 comprising:

(i) a filter comprising a proximal end with an opening formed therein; and

(ii) a plurality of struts coupled to said proximal end of said filter, each of said plurality of struts being biased to open said opening; and

(c) an actuating assembly coupled to said guide member and said filter assembly,

10 said actuating assembly comprising:

(i) a restraining member cooperating with said plurality of struts, said restraining member applying a restraining force to the plurality of struts to prevent the plurality of struts from extending outwardly;

(ii) an actuating member coupled to said restraining member and extending
15 toward said proximal end of said guide member; and

(iii) an actuating element coupled to a proximal end of said actuating member, said actuating element being adapted to move in a proximal direction to release the restraining force to enable said plurality of struts to extend outwardly.

20 45. The filter device as recited in claim 44, wherein said actuating member is disposed in said lumen of said guide member.

46. The filter device as recited in claim 44, wherein said proximal end of said filter,
when deployed, is constrained against the vessel wall.

47. The filter device as recited in claim 44, wherein said guide member further
5 comprises at least one radiopaque marker.

48. The filter device as recited in claim 44, wherein disposed upon a distal end of
the at least one of said plurality of struts is a coiled tip.

10 49. The filter device as recited in claim 48, wherein said coiled tip extends through
an aperture in said filter.

50. The filter device as recited in claim 44, where said plurality of struts are
integrally coupled to said guide member.

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51. The filter device as recited in claim 44, wherein said plurality of struts are
separate members that are coupled to a distal end of said guide member.

52. A filter device comprising:

(a) a guide member comprising a distal end, a proximal end, and a lumen extending from said distal end to said proximal end;

(b) an actuating assembly coupled to said guide member, said actuating assembly comprising:

(i) an actuating member disposed within said lumen of said guide member; and

(ii) an actuating mechanism coupled to said distal end of said guide member and to said actuating member; and

(c) a filter assembly disposed within said lumen and configured to be deployed by said actuating member, said filter assembly comprising:

(i) a filter comprising a proximal end with an opening formed therein; and

(ii) a plurality of struts coupled to said proximal end of said filter and said actuating member, at least one of said plurality of struts being biased to open said opening.

53. The filter device as recited in claim 52, wherein said actuating member is disposed in said lumen of said guide member.

54. The filter device as recited in claim 52, wherein said actuating member is partially disposed in said lumen of said guide member.

55. A filter device as recited in claim 52, wherein said filter assembly comprises means for opening said opening formed in the filter.

5 56. A filter device as recited in claim 55, wherein said means for opening comprises said actuating member.

57. A method for operating a vascular filter device during a procedure, comprising:

(a) inserting a filter device into the vasculature of a patient distal of a portion of a blood vessel to be accessed during a procedure, said filter device comprising:

5 (i) a guide member having a proximal end, a distal end, and a lumen extending from said distal end; and

(ii) a filter disposed within said lumen at said distal end of said guide member;

10 (b) deploying said filter from within said lumen into the blood stream to capture material that is dislodged during the procedure;

(c) retracting said filter until an open-ended proximal end thereof is positioned in relationship with said guide member to prevent said captured material from escaping from said filter; and

15 (d) upon positioning a capture catheter to enclose said filter, removing said filter device and said capture catheter from the vasculature of the patient.

58. A method as recited in claim 57, where said filter device comprises means for an actuating member coupled to said guide member.

20 59. A method as recited in claim 58, further comprising actuating said actuating member to deploy said filter.

60. A method as recited in claim 57, wherein retracting said filter comprises retracting said open-ended proximal end of said filter until said proximal end is in contact with said guide member.

5 61. A method as recited in claim 57, wherein retracting said filter comprises retracting said open-ended proximal end of said filter into said lumen of said guide member.

62. A method as recited in claim 57, wherein deploying said filter comprises pushing said filter from said lumen.

10 63. A method as recited in claim 62, further comprising expanding said proximal end of said filter to form said opening.

64. A method for removing a vascular filter device, comprising:

15 (a) following deploying a filter of a filter assembly from a guide member by moving an actuating member disposed within a lumen of said guide member in a distal direction, retracting said filter until an opened proximal end of said filter is positioned in relationship with said guide member to prevent the captured material from escaping from said filter; and

20 (b) upon positioning a capture catheter to enclose said filter, removing said filter device and said capture catheter from the vasculature of the patient.

65. A method as recited in claim 64, wherein retracting said filter comprises moving said actuating member in a proximal direction by moving an actuator element in a proximal direction.

5 66. A method as recited in claim 65, wherein moving said actuating member further comprises moving said actuator element by-hand to move said actuating member.

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